flutes 39. Because the flutes 39 advantageously extend on opposing sides of strap 20, the strap will need to be removed from both dies. One die may be lifted off, and the strap 20 can then be lifted off the remaining die, or the remaining die can be moved away from the strap 20 which is held during the removal, or ejector pins can be used to remove the formed strap from the remaining die.

[0070] Of course, the elasticity of the material from which the strap 20 is formed must be taken in to consideration if the strap 20 is stamped from metal. If the strap 20 is molded from a polymer based material, such as one or more forms of high durometer plastic, then the contraction of the heated polymer must be considered. If made of material that is caused to flow during the deformation to form the flutes 39, then advantageously, the portion of the flute 39 adjacent the apex 42 is formed first so that material from the outer portion, such as apex 42, is forced toward the opening 26 and base 40. This helps avoid thinning of the peripheral edge 38 and tilting of the edge 38 as in Figure 9b.

[0071] The normal deformation during stamping tends to rotate the corner of the edge 38 toward the axis 37 of the pipe 22, as shown in Figure 9b, and it also results in an opening 26 that is not perfectly circular. One way to resolve this while still using a simple stamping step and die setup, is to perform a further manufacturing step after stamping the flutes 39. Advantageously, a punching or boring step is used to cut the sharp corner of periphery 38 into either a more rounded corner or preferably into a flat portion akin to the edge 38 shown in Figure 9a. This punching or boring step will slightly enlarge the opening, meaning that the preliminary size to which opening 26 is punched, before the flutes are formed, must be selected appropriately. This additional punching or boring operation will ensure the opening 26 is circular when viewed along axis 37 which is perpendicular to the strap 20. The final size of the opening 26 is preferably slightly larger than the outer diameter of the tubing 22. The opening 26 is preferably large enough to allow easy insertion and passage of the tubing 22, but small enough to allow solder to flow by capillary action into a gap between the periphery 38 and tubing 22.

[0072] If the base 40 is offset too far along axis 37 from the plane of the strap 20 containing the longitudinal axis 40, then a die forming sharper, straight sided flutes 39 is more likely to cause the material forming the flute 39 to separate or crack. The undulating peripheral edge 38 preferably provides a continuous edge, rather than being interrupted by a notch or slot or crack or tear in the

material forming the strap 20. A curved base 40 is less likely to separate during formation because it has less stress concentration, and is thus preferred. The greater the radius of curvature, the more deformation is believed possible. Deformations of about 1/16 (.0625 inches) at the center of base 40 are believed achievable in 18 gage (.047 inch) metal straps without splitting or cracking the metal strap 20, even when using the triangular flutes 39.

[0073] Cold deformation is preferred. But in order to increase the offset of the undulations along axis 37, in the direction orthogonal to the plane of the strap 20 that contains the opening 26, then hot deformation may be preferred to form the flutes 39.

[0074] The deformation forming the undulating edge 38 and flutes 39 causes localized work-hardening of the strap 20. Generally, the less disruption of the material, the less the work hardening, so the apex 42 has less work hardening than the base 40. The work hardening thus increases the strength of the strap 20. Further, the shape of the flutes also act as localized stiffeners around the fluted opening 26. That results in a stiffer strap 20 and more stable support for the pipes 22.

[0075] There is thus advantageously provided a strap with increased support for the pipes or tubing 22, as well as a strengthened strap and a stiffened strap. By orientating the fluted openings 26 so the flutes 39 allow a minimal width of the strap 20, a strap of minimum width can be achieved. The narrow width of the strap allows a reduction in material usage and material cost, thus reducing the cost of the part. The flutes 39 provide increased stiffness resulting in a strong, light weight, but strong, strap 20.

[0076] The undulating edge 38 formed by flutes 39 results in an increase in the length of the periphery 38 that encircles and forms opening 26. Normally, the periphery around the opening 26 is defined by the circumference of the opening 26, the circumference having a length of about 3.14 times the diameter of the opening. By deforming the periphery away from the portion of the strap 20 defining the opening 26, the shape of the circular opening 26 can be effectively maintained while the peripheral distance is increased. The increased peripheral distance provides for increased support of pipes 22 extending through the strap 20, and provides increased bonding or soldering area to fasten the strap 20 to the pipe or tubing 22.

[0077] While the undulating, fluted periphery 38 extends on both sides of the strap 20, it is believed possible to have the flutes 39 on the same side of the strap 20, but that configuration is not

believed to work as well because it does not provide as much increase in support as is possible when the undulating edge 38 extends on opposing sides of the strap, nor does it result in the support load being transmitted symmetrically along a plane containing the axis 27. Thus, flutes 39 extending on opposing sides of the strap 20 are preferred.

[0078] Nonetheless, if the strap 20 is placed behind drywall or another wall covering, then the offset of the center of the base 40 is limited because the center of the base 40 will dig in to the wall covering. In such a case, it may be advantageous to have one side of the strap 20 with flutes 39 selected to have an offset to accommodate the covering placed over the strap 20, while the opposing side of the strap has flutes 20 with a greater offset to provide increased support for the tubing 22 held by the strap.

[0079] The undulating periphery provides a more stable support. The deformation of the peripheral edge 38 orthogonal to the strap 20, and along axis 37, provides an increase in the support to the tubing 22 along the axis of the tubing extending through the opening 26. If the strap 20 comprises a flat strip, then the tubing 22 is supported by the thickness of the strap 20 measured along the axis 37. But the strap 20 is typically so thin that the tubing 22 can rock about the strap even though restrained from moving in the plane of the strap. By deforming the periphery 38 of the opening the strap 20 extends further along axis 37, on both sides of the strap 20. That provides a support along the length of the tubing 22 that resists rocking of the tubing.

[0080] The above description is given relative to a plumbing strap 20 that extends between adjacent studs 24. The fluted openings 26 could be used on other supports 20, including T-shaped supports as shown in Figure 12, L-shaped supports as shown in Figure 13, and cantilevered supports as shown in Figure 8. Other variations are possible.

Pipe Cover

[0081] Referring to Figure 14, a tubing, such as water pipe 22, extends from a wall through a pipe support 20, such as plumbing strap. The pipe support advantageously is fastened to a building support and may take the form of the plumbing support shown in Figures 1 and 4 which extends between adjacent studs in a building. Alternatively, the pipe support may take the form of the L, T and other shapes shown in Figures 8, 12 and 14. For convenience, the pipe support 20 will